

FIG. 1

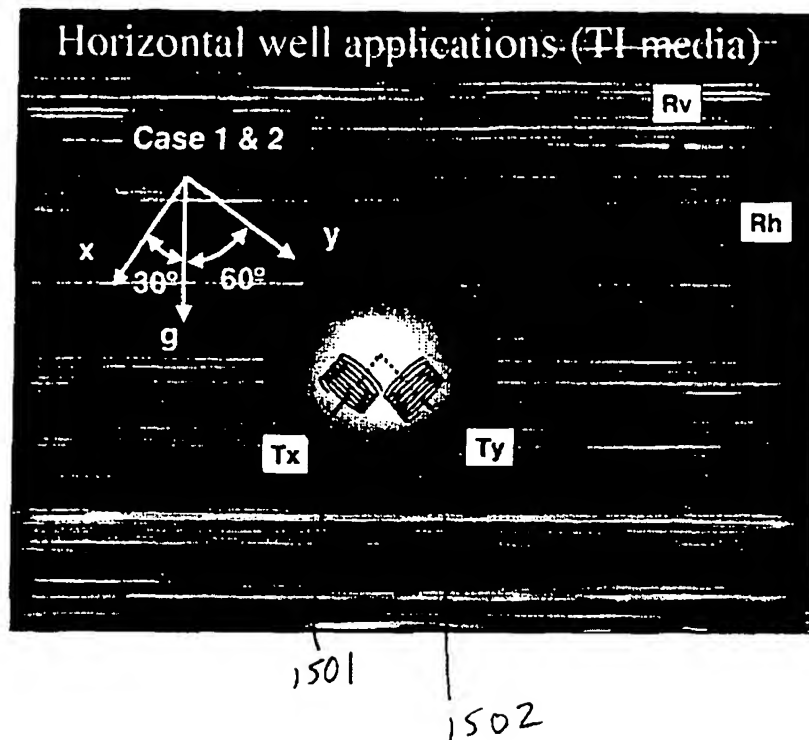


FIG. 2

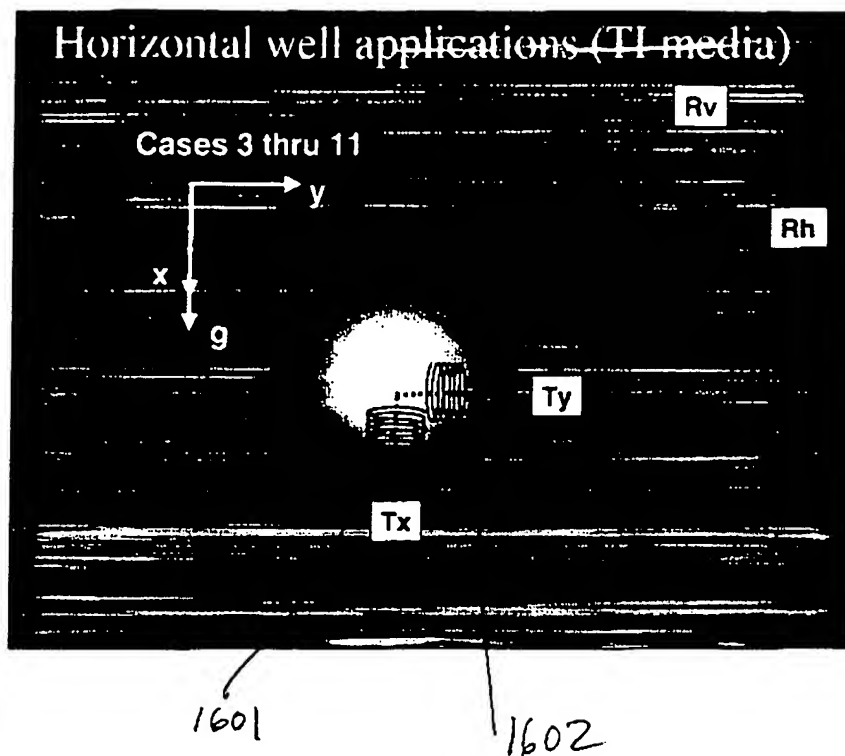


FIG. 3

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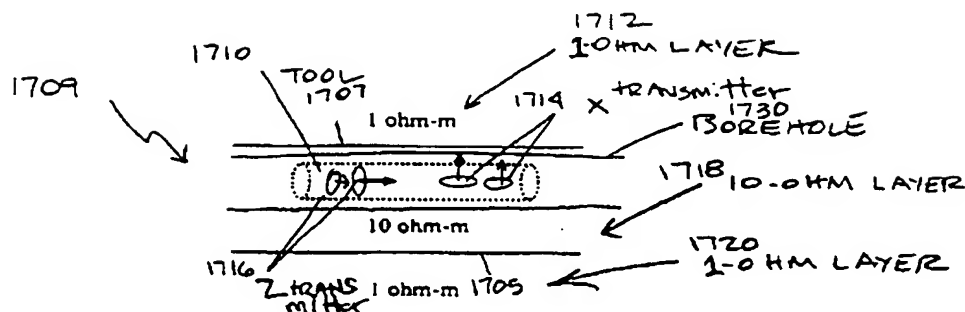
**ATTORNEY**

**G. Michael Roebuck TELEPHONE NO.: 713-266-1130**

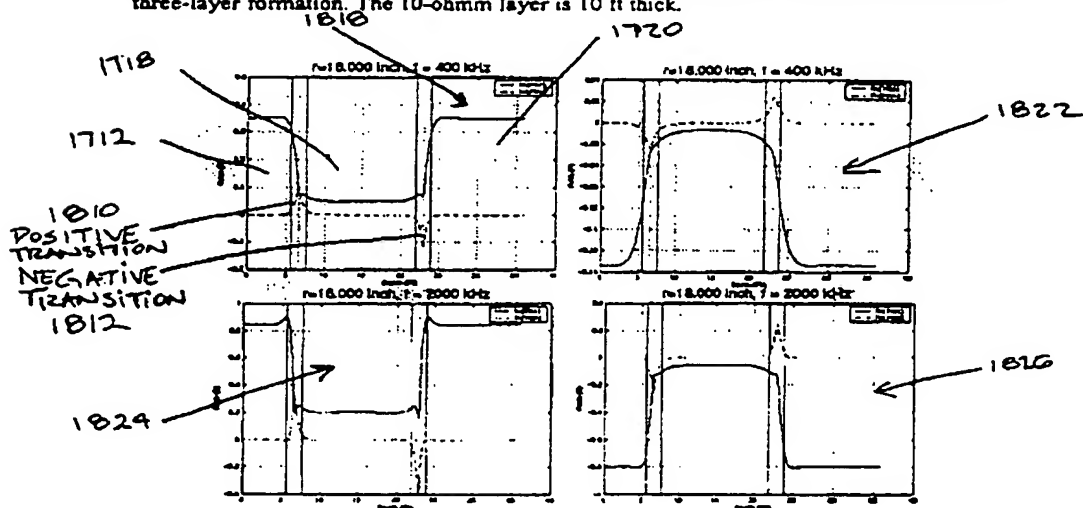
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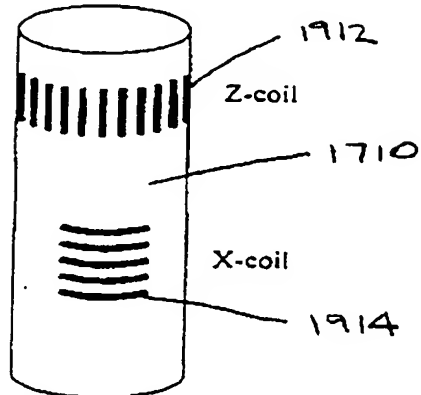
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**FIG. 4** Diagram showing a Z-transmitter (horizontal) and an X-receiver (vertical) in a three-layer formation. The 10-ohmm layer is 10 ft thick.



**FIG. 5** The magnetic field (real and imaginary parts) for the ZX transmitter and receiver configuration in the three-layer formation shown in Figure 1. The 'tool' axis is parallel to the bed boundaries.



**FIG. 6** Arrangement of 'horizontal' grooves to host a transverse (X-) coil. Also shown are vertical grooves used in the current MPR tool to host a Z-coil.

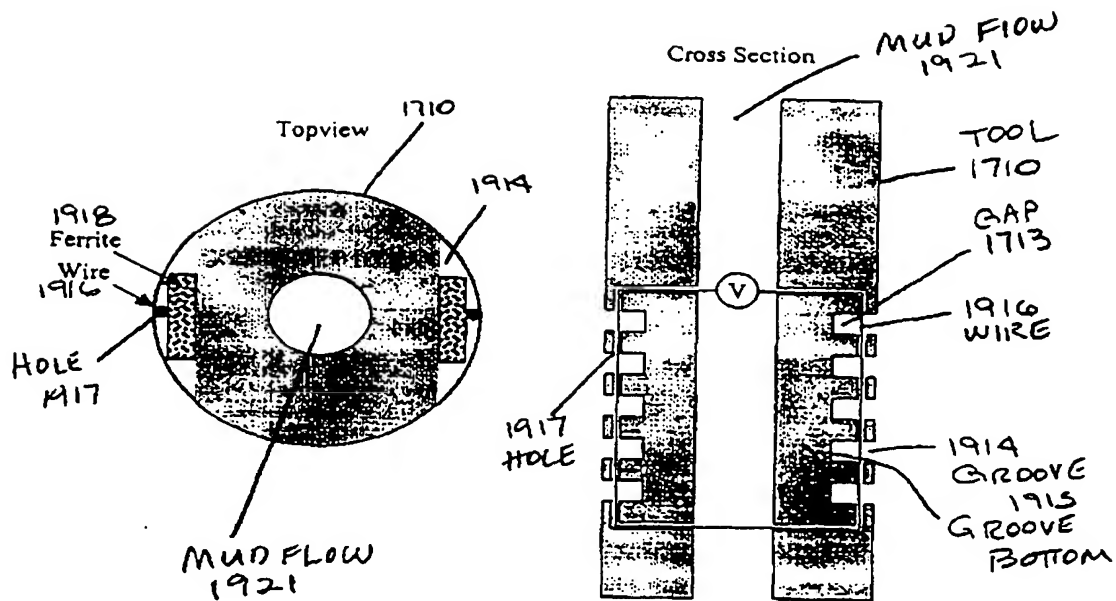
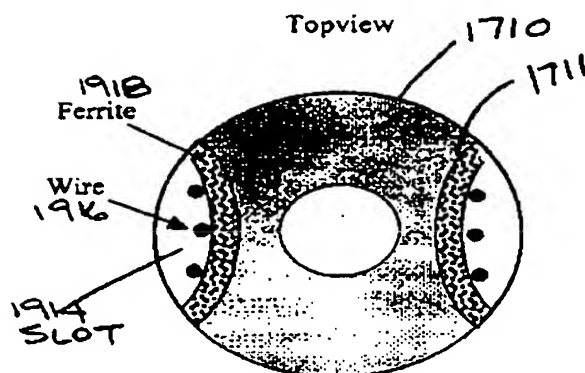
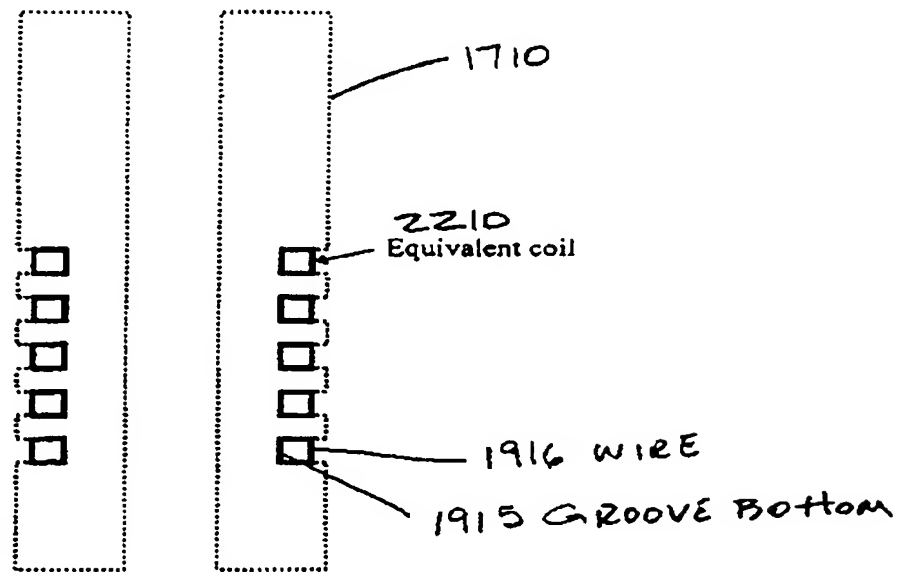


FIG. 7 The top view of a groove with wire and ferrite and the cross-sectional structure of the transverse loop.



**FIG. 8** The top view of a general groove design showing multiple wires backed by a curved ferrite layer on top of the pipe metal.



**FIG. 9** The equivalent coil system for the transverse loop shown in FIG. 7. The small coils all have the same moment direction and therefore their contributions add to each other. The coil size is given by the gap between the wire and the groove bottom in FIG. 7.



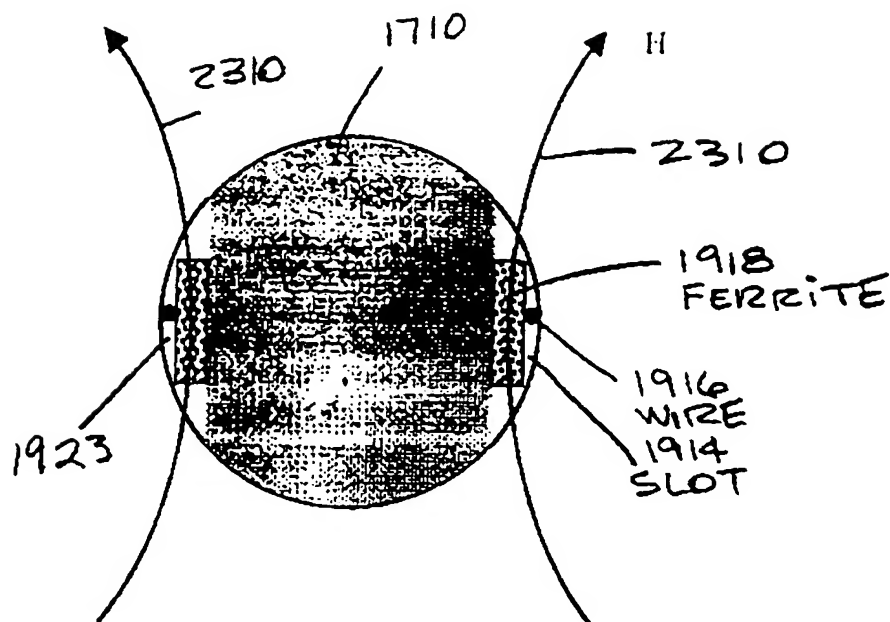


FIG. 10 Reception of magnetic field by a transverse coil.

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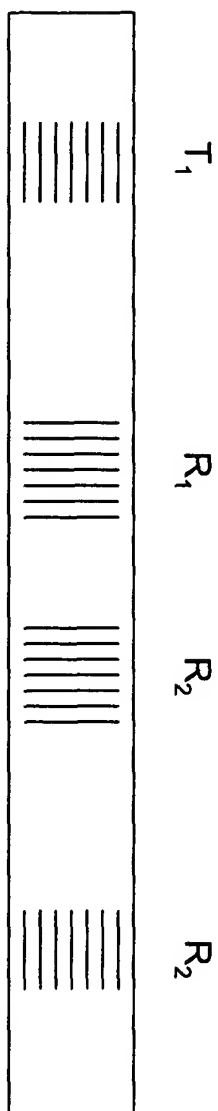


Figure 11. An arrangement of dual transmitters and dual receivers.